Cisco ONS 15454 Multiservice Transport Platform

Product Overview

The Cisco® ONS 15454 Multiservice Transport Platform sets the industry benchmark for dense wavelength-division multiplexing (DWDM) solutions delivering simple, fast, and intelligent DWDM capabilities and lowering capital and operating expenditures.

When Cisco introduced the Cisco ONS 15454 Multiservice Provisioning Platform (MSPP) for the metropolitan (metro) market in 1999, a clear demarcation was created between what is considered “traditional” optical transport equipment and what is now considered “next-generation.” With its significant leap in technology and product migration, the Cisco ONS 15454 MSPP offered traditional time-division multiplexing (TDM) and SONET/SDH services as well as Ethernet and IP services. The platform was scalable and was the fraction of the size of traditional bit-rate-specific equipment. The Cisco ONS 15454 MSPP proved to be cost-effective, and it uniquely met the requirements for the new market segment. The Cisco ONS 15454 MSPP quickly established itself as the market leader.

Continuing with its tradition of innovation and leadership, Cisco has introduced the Cisco ONS 15454 Multiservice Transport Platform (MSTP), which is transforming DWDM networks. The Cisco ONS 15454 MSTP (Figure 1) allows a DWDM system to become as intelligent and flexible as the highly successful Cisco ONS 15454 MSPP, including wide service interface mix, service transparency, flexible topology, completely reconfigurable traffic pattern, and simplified operations.

Figure 1. Cisco ONS 15454 Multiservice Transport Platform M12 (12 slots for traffic) – ANSI (left) and ETSI (right)

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Figure 2. Cisco ONS 15454 Multiservice Transport Platform M2 (2 slots for traffic, left) and M6 (6 slots for traffic, right)

Key Features and Benefits

The Cisco ONS 15454 MSTP provides capital and operational efficiency by addressing the increasing demand for multiple services, greater transport capacity, networking flexibility, multiple distance options, and management simplicity in a single platform. With innovative technology, Cisco ONS 15454 MSTP introduces intelligence to DWDM transmission, thus allowing the optimization of next-generation networks across multiple layers and removing costly Optical-Electrical-Optical (OEO) devices for network segmentation or regeneration.

The Cisco ONS 15454 MSTP provides features such as multilayer graphical network, node, and card visibility; A-to-Z network-based service provisioning; and graphical software wizards to simplify and speed user operations for such tasks as initial network turn-up, service provisioning, and network, node, and bandwidth upgrades. The Cisco ONS 15454 MSTP uses the embedded software architecture and control plane to introduce a level of operational simplicity unheard of in DWDM networks.

The Cisco ONS 15454 MSTP delivers a rich set of features, allowing customers worldwide to support the requirements of next-generation transport networks:

- Scalable C-band wavelength count (1–80) for superior cost-versus-growth tradeoff, on the same fiber pair
- Transport of 150-Mbps to 40-Gbps wavelength services, as well as aggregated TDM, Ethernet, and storage data services, for maximum service flexibility and bandwidth optimization
- Multiple chassis options: The classic 12-slot (17 slots total), 48 VDC, small-footprint M12 chassis is available with AC or DC power supply. The M6 chassis provide six available slots for traffic (eight slots total). Similarly to the M12 it supports a multi-shelf configuration to extend the total node capacity. The M2 chassis provides two slots for traffic (three slots total). The M2 runs with a single node controller.
- Efficient Gigabit Ethernet and 10 Gigabit Ethernet transport over DWDM with Cisco's XPonder service blades. Available in two versions (20 Gigabit Ethernet client ports and two 10-Gbps trunk ports, or two 10 Gigabit Ethernet client ports and two 10-Gbps trunk ports), the XPonder provides unprecedented flexibility to map Ethernet services directly onto a wavelength while performing a variety of Layer 1 or Layer 2 functions. This new approach provides a more efficient use of available bandwidth and unprecedented Gigabit Ethernet-over-DWDM mapping and traffic policing flexibility. The capability to use G.709 encapsulation and Forward Error Correction (FEC) and Enhanced Forward Error Correction (E-FEC) functionalities on the 10 Gigabit Ethernet LAN-PHY wavelength helps ensure optimized performance and reach; typical SONET/SDH-like OAM&P supports the management functions of previous SONET/SDH-type interfaces while interfacing directly to the DWDM layer; a patented protection scheme can react to failures in less than 50 milliseconds (ms).

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- The Cisco ONS 15454 MSPP-on-a-Blade Card combining 10-Gbps ADM and transport functionalities using multirate SFP (client) and XFP (client and trunk) configurable interfaces to consolidate many of the aggregation functions traditionally performed by the MSPP with multiple service blades and common cards. With one blade, carriers can now aggregate OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64, and Gigabit Ethernet signals (on a user-definable port-by-port basis) on to a single-wavelength trunk circuit. The capability to use G.709 encapsulation and FEC/E-FEC functionalities on the OC-192/STM-64 wavelength helps ensure optimized performances and reach, and complete OAM&P capabilities.
- 4-Port 10-Gbps Full-Band Tunable 40-Gbps DQPSK Muxponder Card and 40-Gbps Full-Band Tunable DQPSK Transponder Card extend the overall data bandwidth that can be transported by the system by a factor of four, allowing the Cisco ONS 15454 MSTP to transmit up to 3.20 Tbps over 80 channels at 40 Gbps.
- Flexible transmission capability up to 2000 miles (more than 3200 kilometers) through the use of advanced Erbium-Doped Fiber Amplifier (EDFA) amplification, joint Raman and EDFA amplification, and FEC or E-FEC technologies to support a wide range of networking applications
- Ready-to-use card architecture for complete flexibility in configuring DWDM network elements: terminal nodes, optical add/drop nodes, Degree-2 and multi-degree reconfigurable optical add/drop multiplexer (ROADM) nodes, line amplifiers, and dispersion compensation within amplified or unamplified networks
- High shelf density for high-bandwidth (10-Gbps and 40-Gbps) wavelength services
- Fully reconfigurable optical add/drop multiplexers (ROADMs) for superior network flexibility and reduced complexity
- Mesh and multi-ring topology support in the optical domain with the possibility to manage nodes facing up to eight degrees. These capabilities allow Cisco ONS 15454 MSTP users to provide wavelength services and to define virtual private DWDM networks, where a common transport infrastructure can be shared across multiple users or services.
- Single-module ROADM solutions dramatically improving system density and flexibility to support Degree-2 or mesh node configurations up to Degree-4. Through the integration of ROADM and Optical Amplification into single-slot units (available with Pre-Amplifier only or with Pre- and Booster Amplifier), now the Cisco ONS 15454 MSTP can be configured to support loss-less ROADM capabilities and can be deployed to support in-service upgrades of an optical line amplifier (OLA) site to a 40-channel, multi-degree ROADM in a very compact and power-efficient single-shelf configuration. In addition to this, enough empty slots are available in the shelf to support up to 200 Gbps of bidirectional transport capacity.
- Omni-directional and colorless support for ROADM nodes to allow service creation and restoration in a fully automated way (software provisioning). This unique capability of the Cisco ONS 15454 MSTP is a key enabler for IP-over-DWDM applications where DWDM colored and colorless signals from routers, switches, or SAN platforms can be directly transported and managed in the DWDM network.
- Flexible add/drop capabilities, from 1- to full 112-channel granularity, supporting both band and channel optical add/drop multiplexers (OADMs)
- Software-provisionable, Small Form-Factor Pluggable (SFP) and 10 Gigabit SFP (XFP) module client and DWDM optics modules and full-band wavelength tunability for reduced inventory of spares
- Fully automatic node and network setup with the possibility to use the intuitive DWDM network design tool (Cisco TransportPlanner) for PC-aided design, installation, commissioning, and evolution of the network
- Multilevel service monitoring using SONET/SDH and digital-wrapper (G.709) technology to provide complete monitoring and reporting of performance and quality parameters for Ethernet, SAN, video, and TDM services
- Integrated optical supervisory channel (OSC) for unparalleled service reliability and platform manageability
- Network topology autodiscovery supported directly at the Network Element (NE) level and allowing Element Manager System (EMS)-like functionalities directly through the platform embedded software

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- Network-level and node-level alarm correlation performed directly by the embedded NE software to allow a simpler and faster reaction to fault situations by providing just the root-cause of the problem to the management interface
- Integrated Cisco Transport Controller for network-based, point-and-click system and services setup and management
- Virtual transponder operation for routers (such as the Cisco CRS-1 Carrier Routing System) equipped with a DWDM physical line interface module (PLIM), allowing end-to-end service provisioning between routers through the complete DWDM network directly from Cisco Transport Controller
- Software-controlled optical power management for fully automated network optical power control, especially during wavelength additions, site additions, and fast transient suppression in the case of a fiber cut
- Network-level functional view to provide Cisco ONS 15454 MSTP customers the possibility to manage and monitor optical circuits between source and destination nodes and collect all the relevant data pertaining to optical power levels and performance monitoring. This newly engineered GUI-based view of optical circuits across the network allows users the possibility to collect real-time data from the network “horizontally” across all the network elements that the optical circuit is passing through, without being distracted by other data or alarms not of direct interest. It also allows users to track the optical path of the specific DWDM wavelength(s) across the different units in the node and to retrieve any excess loss or mis-cabling that may have occurred.
- Support by an advanced, cross-platform optical network management system (NMS), the Cisco Transport Manager, for unified network operations and interface to an operations support system (OSS)

In addition to the integrated software features, the Cisco ONS 15454 MSTP is supported by an easy-to-use but powerful network design tool, the Cisco TransportPlanner. Cisco TransportPlanner is a user-friendly, Java-based application (fully developed and tested by Cisco) for modeling and optimizing DWDM networks based on the user’s network parameters. Cisco TransportPlanner also reduces operational expenditures by simplifying network deployments through the following:

- Simple drag-and-drop user operation for network and services definition
- Optimized services and units allocation in case of network topology or traffic matrix changes for an already deployed network (delta planning)
- Support for linear, ring, multi-ring, and mesh network topologies
- Fully flexible network design with the possibility to optimize the flexibility provided by the ROADMs (in the optical domain) and by the multirate cards (in the service and application domain)
- Alien wavelengths optical interface definition to allow design of optical networks that can reuse DWDM interfaces already available to the customer, hence simplifying the migration of services and reducing the upfront cost of new systems
- Automatic equipment selection
- Layered graphical views of network, wavelength services, and node layout, with the option to select between a card or a functional view of the node
- Detailed port-to-port fiber-cabling table
- Bill-of-material output
- Network and node layout, with the option to collect and export data pertaining to power consumption, heat dissipation, and overall weight of the configuration
- Exportable configuration file, which can be used for automated node-provisioning and quick network activations

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Wide Service Interface Mix

The Cisco ONS 15454 MSTP supports a wide set of interface and service types, which can be fully transparently transported through complex mesh or very simple point-to-point networks. The service interfaces allow network providers to offer new tariffs and allow enterprise customers to natively transport a wide variety of services over a common transport network without unnecessary conversion stages and equipment. Additionally, a wide service mix simplifies the planning for services. The Cisco ONS 15454 MSTP supports a broad range of standards-based services in a single platform, including:

- Aggregated lower-rate TDM services from DS-1/E1 over 2.5-Gbps and 10-Gbps wavelengths
- SONET/SDH wavelength and aggregated services: OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64, and OC-768/STM-256
- OTN wavelength and aggregated services: OTU-2 and OTU-3
- Data services: private-line, switched and wavelength-based, including 10/100BASE-T, Gigabit Ethernet, 10 Gigabit Ethernet LAN physical layer, and 10 Gigabit Ethernet WAN physical layer
- Storage services: 1-Gbps, 2-Gbps, 4-Gbps, 8-Gbps, and 10-Gbps Fibre Channel; IBM Fiber Connection (FICON) and Enterprise Systems Connection (ESCON); ETR/CLO; ISC-1 and ISC-3
- Video services: D1, DV6000, and high-definition television (HDTV)

Service Transparency

Critical to offering a wide service mix is a DWDM system's ability to offer the level of transparency required by the service. The Cisco ONS 15454 MSTP solution offers the choice of multiservice aggregation, wavelength aggregation, and wavelength transport, combined with integrated, intelligent DWDM transmission, in a single platform to minimize network costs for any mix of service types. Using digital-wrapper and Optical Transport Network (OTN) technologies (defined in ITU-T G.709) enables transparency, allows enhanced wavelength management, and provides extended optical reach thanks to the integrated FEC and E-FEC.

Unique to the market is also the possibility for the Cisco ONS 15454 MSTP to support direct interconnection with DWDM interfaces from Layer 2, Layer 3, and storage area network (SAN) devices. This element integration eliminates the need for costly and complex OEO conversions at the boundaries of the network or where the traffic simply needs to pass through a site without having to terminate on a router (for IP processing) or on a SAN device. In cases where termination is necessary, the Cisco ONS 15454 MSTP hands off the optical wavelength, keeping it in the optical domain without the need to perform an electrical conversion in order to hand off the traffic to the Layer 2, Layer 3, and SAN devices, where the electrical conversion is used only for service processing.

All the intelligent optical-transmission-related features and functions can be supported by the Cisco ONS 15454 MSTP with these types of "alien" wavelengths and services as well.

Protection Options

The Cisco ONS 15454 MSTP provides multiple provisionable interface protection options, which facilitate support for high-availability as well as unprotected service delivery to meet the varied service-level agreements (SLAs) for DWDM transport offerings.

Both 1+1 and shared protection schemes based on the principles of ITU-T recommendations are supported. The following types of 1+1 protection schemes can be supported:

- Path Protection

  In this case it is possible to offer complete redundancy of the optical path at the network level but no protection is offered for the unit that is originating the Working and the Protect DWDM signal and deciding among the two DWDM signals on the receive side.

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This type of protection can be supported on individual wavelengths by Cisco's 2.5-Gbps transponder and muxponder cards (using their Protected versions); by the Gigabit Ethernet and the 10 Gigabit Ethernet XPonder units (operating in Layer 2 mode); by the MSPP-on-a-Blade card; by the OTU2 XPonder unit; and by the Protection Switching Module (PSM), when used in conjunction with unprotected transponder or muxponder units, or with an alien DWDM signal. The PSM unit can be used to provide protection for the multiplexed signal.

- Path and Equipment Protection

  In this case it is possible to offer complete redundancy of the optical path at the network level and of the units that are originating the Working and the Protect DWDM signals and deciding among the two DWDM signals on the receive side.

  This type of protection can be supported by 2.5-Gbps transponder and muxponder units (using their Unprotected versions); by 10-Gbps transponder and muxponder units; by the Gigabit Ethernet and the 10 Gigabit Ethernet XPonder units (operating in Layer 1 and Layer 2 mode); or by the OTU2 XPonder unit.

- Multiplex Section Protection

  In this case it is possible to use the PSM unit to provide protection for the aggregated signal.

Shared protection can be supported by the Gigabit Ethernet and the 10 Gigabit Ethernet XPonder units using the revolutionary GR3 Ethernet protection (Cisco patented G.709 Rapid Resilient Ring Ethernet Protection mechanism), when operating in Layer 2 mode. By integrating G.709 messaging with an Ethernet VLAN management mechanism, GR3 protection provides SONET/SDH-like switching times and reliability. A recovery time of less than 50 ms can be achieved mapping Ethernet directly over DWDM.

Different units can support different protection options and feature different capabilities, which are described in more detail in the unit data sheets.

Topology Flexibility

One recent core network trend is the consolidation of multiple Layer 2/3 networks into a single IP/Multiprotocol Label Switching (IP/MPLS) infrastructure. In spite of this Layer 2/3 convergence, however, the underlying transport layer (Layer 1) of many service provider core networks has continued to use SONET/SDH. This has remained largely the case in many service provider networks globally today, creating OpEx and CapEx concerns for service providers as well as the challenges of profitability and return on investment. Some network inefficiencies result from the way core transport networks are built out today to support the IP or service layer over the SONET/SDH layer, supported by an underlying DWDM infrastructure. The OEO conversions and the associated electrical processing driven by the layered network architecture result in an additional cost in terms of space, because many racks of shelves may be required in a service provider POP, as well as additional power and cooling that is necessary because of the active electronics components that they contain.

The Cisco ONS 15454 MSTP can be configured to support any metro, regional, or core DWDM topology, allowing a single solution to be used for the overall network, independently from the topology and reach. The ultimate topology flexibility is achieved through a set of fully reconfigurable optical add/drop multiplexers (ROADMs). Multi-degree ROADMs (2 through 8 degrees of freedom) allow wavelengths to remain in the optical domain while being passed from one ring or network segment to another, further eliminating the need for OEO conversions and utilizing the ability of core routers to initiate DWDM-compatible wavelengths (Figure 3).

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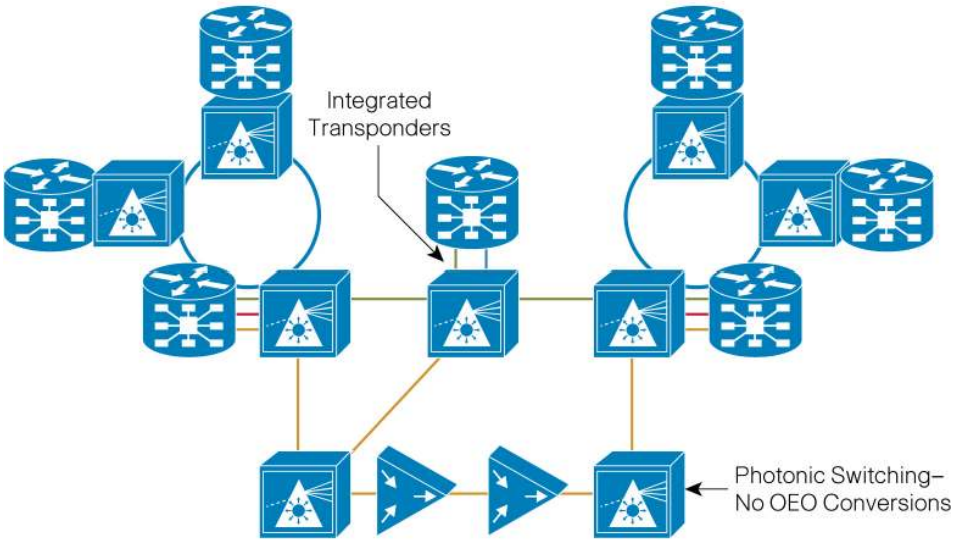
Figure 3. Cisco Next-Generation Network Strategy



The Cisco ONS 15454 MSTP offers ROADM capability that allows zero to 40 channels of pass-through or add/drop, A-Z wavelength provisioning, and full real-time power monitoring of each individual wavelength. Keeping traffic purely in the optical domain as much as possible has the added advantage of "future-proofing" a transport network. Pure optical transmission is inherently more tolerant to bit-rate variations where moves to higher rates and new protocols may still be required in the future, and hence more robust because photonic processing is intrinsically insensitive to protocol changes, unlike typical electrical processing elements.

Product Specifications

With its multiservice capability, innovative optical technology, automatic optical power management, and MSPP-like ease of use, the Cisco ONS 15454 MSTP transforms how DWDM networks can be built and managed. Combining multiple services and intelligent DWDM, the Cisco ONS 15454 MSTP significantly reduces both CapEx and OpEx for today's metro and regional networks.

Node Configurations

- Terminal
- Hub
- Line amplifier
- OADM
- Degree-2 ROADM
- Degree-2 SMROADM
- Multi-degree ROADM
- Multi-degree SMROADM
- Omni-directional and colorless available on ROADMs

Network Configurations

- Linear point-to-point
- Ring (multiple-hub or no hub)
- Multi-ring
- Mesh

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Advanced Intelligent Software Features

- Network topology auto-discovery
- Point-and-click node and network setup and regulation
- Automatic network-level optical power management and monitoring
- Single management interface (single IP address) for all the shelves in a node
- Network-level alarm correlation for a quick and easy troubleshooting (G.798-based)
- DCN extension to provide the possibility to use any available DCN access (including DCC and GCC bytes) for management of nodes
- Automatic node turn-up for installation and deployment without the use of Cisco TransportPlanner parameters

User Interface: Cisco Transport Controller

- Integrated node and sub-network craft GUI
- Layered graphical views: network, wavelength, node, shelf, card
- Network- and Node-level Functional View, automatically generated and aligned with equipment status for the possibility to manage and collect performance-monitoring data end-to-end through the network between the source and the destination nodes
- User-provisionable graphics and fonts
  - Background maps
  - Color schemes
- A-to-Z wavelength circuit routing and creation
- Network auto-discovery with provisionable sub-network domain control
- System inventory
- PC-based Java client
- Familiar browser interface
- Complete performance-monitoring support
  - 15-minute (32 entries) and 24-hour (two entries)
  - Optical layer
  - SONET/SDH layer
  - Ethernet and SAN statistics
  - ITU-T G.709 layer (including FEC/E-FEC)
  - Client interface type-specific
  - Threshold-crossing alerts threshold setting

Alarm Monitoring and Reporting

- Shelf LEDs – Critical, major, minor, remote
- Card LEDs – Card failure, active/standby state, signal fail
- Cisco Transport Controller craft interface
  - Layered graphical views with real-time alarm text and coloring: network, wavelength, node, shelf, card
  - Multiple technology views including DWDM and SONET/SDH with MSTP integration
- Environmental alarm contacts
  - 4-alarm output contact closures (standard): critical, major, minor, remote

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- Up to 48 provisionable alarm contacts in systems equipped with Alarm Interface Controller (AIC-I)

Network Security Features

- Four-level user control with provisionable timeout durations: super-user, provisioning, maintenance, retrieve
- Multiple user names and logged-in users
- RADIUS-based authentication
- SSL, SSH, HTTPS

Maintenance Features

- Remote software downloads and in-service, hitless activation
- Loopbacks
- Database backup and restore
- Lamp test

Timing and Synchronization

- Two external timing-source inputs (SONET, T1 and SDH, E-1, 2 MHz)
- Line timing
- Two timing-source outputs
- Internal Stratum 3
- Synchronous status-messaging support

Additional Features

- 100-Mbps user data channel (Fast Ethernet) transported on the optical supervisory channel (OSC)
- Front only (ETSI) or front and rear access (ANSI) shelf assembly options
- A and B fully redundant and monitored DC power inputs

Carrier-Class Availability

- Delivers better than 99,999 percent availability
- All cards hot-swappable
- Fully redundant Network Element processor and database

Compliance and Certifications

- Network Equipment Building Standards (NEBS) Level 3 compliance
- ITU-T and CE Mark compliance
- Operations Systems Modification of Intelligent Network Elements (OSMINE) certifications
- Storage-vendor qualification and certifications
- MEF 9 and MEF 14 certification for Gigabit Ethernet and 10 Gigabit Ethernet XPonder units

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Technical Specifications

Table 1 lists the supported modules for the Cisco ONS 15454 MSTP.

Table 1. Supported Modules

Module	Unit Name
Common Equipment	
Shelf assembly	
M12 ANSI and ETSI	SA-HD, SA-HD-DDR or SA-ETSI version
M6	M6-SA (AC and DC options available)
M2	M2-SA (AC and DC options available)
Fan-tray assembly	
M12	CC-FTA, FTA3-T (ANSI) or FTA-48V (ETSI)
M6	M6-FTA
M2	M2-FTA
Timing, communications, and control card (TCC)	
M12	TCC2P, TCC3
M6	TNC
M2	TSC
Alarm Interface Controller (AIC) and Alarm Expansion Panel (AEP)	AIC-I (AEP option for ANSI)
Power, craft, alarm mechanical interface cards	
M12 (ETSI)	CTP-MIC48V
	AP-MIC48V
M6	M6-AC or M6-DC
	M6-PWRFLR, M6-FTF=
	M6-LCD
	M6-ECU
M2	M2-AC or M2-DC or M2-DC-E
	M2-FTF=
	M2-LCD
	M2-ECU
Air ramp	AIR-RAMP
Slot filler card	
Interface and control (12, M6 and M2)	BLANK
Front Mount Electrical Connection (FMEC) (ETSI) – M12 only	BLANK-FMEC
Detectable Control (M6 and M2)	M-T-FILLER
Detectable Line (M6 and M2)	M-FILLER
Multi-shelf management cards (M12)	
Integrated multi-shelf switch	MS-ISC-100T
Ethernet adapter panel mechanical frame	EAP-MF
Ethernet adapter panel	EAP
Multiple Ethernet cable	MEC
Fiber management	
Fiber patch panel shelf	PP-64-LC/PP2-64-LC or PP-80-LC
Fiber jumper storage shelf	FBR-STRG

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Module	Unit Name
Optical Transmission Elements	
Multiplexer and demultiplexer filters	
40-wavelength multiplexer, 100-GHz, C band	40-MUX-C
40-channel demultiplexer, 100-GHz, Odd, C band	40-DMX-C
40-channel demultiplexer, 100-GHz, Even, C band	40-DMX-CE
40-channel multiplexer/demultiplexer patch panel, 100-GHz, C band – Odd	MD-40-ODD
40-channel multiplexer/demultiplexer patch panel, 100-GHz, C band – Even	MD-40-EVEN
Multiplexer/demultiplexer plug-in interleaver module	MD-ID-50
32-wavelength multiplexer, 100-GHz, C band	32MUX-O
32-wavelength demultiplexer, 100-GHz, C band	32DMX-O
32-channel demultiplexer 100-GHz (for use with 32-WSS), C band	32-DMX
32-channel demultiplexer 100-GHz (for use with 32-WSS), L band	32-DMX-L
4-wavelength multiplexer/demultiplexer, 100-GHz, C band	4MD-xx.x
Edge Mounting Bracket	15216-HD-EXT-PNL
Edge 4-Ch Bi-Directional OADM Mod 15xx.xx to 15xx.xx	15216-FLD-4-xx.x
Edge 8-Ch CWDM Mux/Dmx Module	15216-FLC-CWDM-8
Edge Optical Service Channel Add/Drop	15216-FLD-OSC
Optical amplifier	
Preamplifier, 50-GHz capable, C band	OPT-PRE
Booster amplifier, 50-GHz capable, C band	OPT-BST
Optical amplifier, 17dB gain, 50-GHz capable, C band	OPT-AMP-17C
Enhanced Booster amplifier, 50-GHz capable, C band	OPT-BST-E
Enhanced optical amplifier, 20 dBm output power, 50-GHz capable, C band	OPT-AMP-C
Raman amplifier, embedded EDFA, C band	OPT-RAMP-C
Extended performance Raman amplifier, embedded EDFA, C band	OPT-RAMP-CE
Amplifier (can be used as Preamplifier or Booster), L band	OPT-AMP-L
Booster amplifier, 50-GHz capable, L band	OPT-BST-L
Reconfigurable optical add/drop multiplexer	
40-channel wavelength cross connect, 100-GHz, odd, C band	40-WXC-C
80-channel wavelength cross connect, 50-GHz, C band	80-WXC-C
Degree-4 mesh patch panel	PP-MESH-4
Degree-8 mesh patch panel	PP-MESH-8
40-channel wavelength selective switch, 100-GHz, odd, C band	40-WSS-C
40-channel wavelength selective switch, 100-GHz, even, C band	40-WSS-CE
40-channel single-module ROADM with integrated PRE amp, 100-GHz, C band	40-SMR1-C
40-channel single-module ROADM with integrated PRE and BST, 100-GHz, C band	40-SMR2-C
Degree-4 single-module ROADM mesh patch panel	PP-4-SMR
32-channel wavelength selective switch, 100-GHz, C band	32-WSS
32-channel wavelength selective switch, 100-GHz, L band	32-WSS-L
Multi-ring/mesh upgrade unit, C band and L band	MMU
Protection switching module	PSM
Optical band add/drop multiplexer	
1-band, 50-GHz capable, C band	AD-1B-xx.x
4-band, 50-GHz capable, C band	AD-4B-xx.x
Optical channel add/drop multiplexer	
1-channel, 100-GHz, C band	AD-1C-xx.x
2-channel, 100-GHz, C band	AD-2C-xx.x
4-channel, 100-GHz, C band	AD-4C-xx.x
Optical service channel	
Standard	OSCM
Integrated combiner and separator	OSC-CSM
Dispersion compensation	
Dispersion compensation unit shelf assembly (2-slot)	DCU-SA
Dispersion compensation units (DCUs)	DCU-<value>
Tunable DCU coarse granularity C band	TDC-CC
Tunable DCU fine granularity C band	TDC-FC

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Module	Unit Name
Y-cable protection modules	
Shelf assembly	YCBL-LC or FL-SA
Y-cable protection module, single-mode	YCM-SM-LC or CS-SM-Y
Y-cable protection module, multimode	YCM-MM-LC or CS-MM-Y
System capacity scalability units	
50-GHz – 100-GHz interleaver/de-interleaver	ID-50
C and L band splitter – combiner	SC-CL
MD 50-GHz – 100-GHz interleaver/de-interleaver	MD-ID-50=
Wavelength Interfaces	
2.5-Gbps transponder/muxponder units	
2.5-Gbps FEC multirate transponder – unprotected	MR-L1-xx.x
2.5-Gbps FEC multirate transponder – protected	MRP-L1-xx.x
2.5-Gbps data muxponder – unprotected	DM-L1-xx.x
2.5-Gbps data muxponder – protected	DMP-L1-xx.x
10-Gbps transponder/muxponder units	
10-Gbps E-FEC multirate transponder – 4-channel tunable	10E-L1-xx.x
10-Gbps E-FEC multirate transponder – band tunable	10E-L1-y
10-Gbps E-FEC multirate transponder – extended performance – full C-band tunable	10EX-L1-C
4x2.5-Gbps E-FEC muxponder – 4-channel tunable	10ME-L1-xx.x
4x2.5-Gbps E-FEC muxponder – band tunable	10ME-L1-y
4x2.5-Gbps E-FEC muxponder – extended performance – full C-band tunable	10MEX-L1-C
10-Gbps E-FEC data muxponder – band tunable	10DME-y
10-Gbps E-FEC data muxponder – extended performance – full C-band tunable	10DMEX-C
40-Gbps transponder/muxponder units	
4x10-Gbps DPSK muxponder – full C-band tunable	40G-MXP-C
XPonder units	
GE XPonder	GE-XP
GE XPonder – enhanced	GE-XPE
10GE XPonder	10GE-XP
10GE XPonder – enhanced	10GE-XPE
OTU2 XPonder	OTU2-XP
MSPP-on-a-Blade	ADM-10G
Pluggable Modules	
SONET/SDH	
SFP – OC-3 SR1/STM-1 I-1.1 – SM	ONS-SE-Z1
SFP – OC-3 SR1/STM-1 – MM	ONS-SI-155-SR-MM
SFP – OC-3 IR1/STM-1 S-1.1 – SM	ONS-SI-155-I1/ONS-SI-622-I1/SFP3-1-IR/SFP-L.1.1
SFP – STM-1 Electrical	ONS-SC-155-EL
SFP – OC-12 SR1/STM-4, I-4.1 – SM	ONS-SE-Z1
SFP – OC-12 IR1/STM-4 S-4.1 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – OC-3 LR2/STM-1 L-1.2 – SM	ONS-SI-155-L2
SFP – OC-48 SR1/STM-16 I-16.1 – SM	ONS-SI-2G-S1/ONS-SE-2G-S1
SFP – OC-48 IR1/STM-16 S-16.1 – SM	ONS-SI-2G-I1/ONS-SE-Z1/SFP-OC48-IR/SFP-L.16.1
SFP – OC-48 LR2/STM-16 L-16.2 – SM	ONS-SI-2G-L2/ONS-SE-2G-L2
XFP – OC-192 SR1/STM-64 I-64.1 – SM	ONS-XC-10G-S1
XFP – OC-192 IR2/STM-64 S-64.2 – SM	ONS-XC-10G-I2
XFP – OC-192 LR2/STM-64 L-64.2 – SM	ONS-XC-10G-L2
SFP-E3/DS-3 PDH over FE pseudowire – Commercial Temp	ONS-SC-E3-T3-PW

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Module	Unit Name
Ethernet	
SFP – FE 10BASE-T – Electrical	ONS-SE-ZE-EL
SFP – FE 100BASE-T – Electrical	ONS-SE-ZE-EL
SFP – FE 100BASE-LX – SM	SFP3-1-IR/SFP-L.1.1
SFP – FE 100BASE-FX – MM	ONS-SI-155-SR-MM
SFP – GE 1000BASE-T – Electrical	ONS-SE-ZE-EL
SFP – GE 1000BASE-LX – SM	ONS-SE-G2F-LX/ONS-SE-Z1
SFP – GE 1000BASE-SX – MM	ONS-SE-G2F-SX
SFP – GE 1000BASE-ZX – SM	ONS-SE-GE-ZX/ONS-SI-GE-ZX
SFP – 1000BASE BX U – GE Bidirectional Upstream – SM	ONS-SE-GE-BXU
SFP – 1000BASE BX D – GE Bidirectional Downstream – SM	ONS-SE-GE-BXD
SFP-OC-3/STM-1/FE Optical Service Channel SFPs ULH – Commercial Temp	ONS-SC-OSC-ULH
XFP – 10GE BASE-LR – SM	ONS-XC-10G-S1
XFP – 10GE BASE-LW – SM	ONS-XC-10G-S1
XFP – 10GE BASE-ER – SM	ONS-XC-10G-I2
XFP – 10GE BASE-EW – SM	ONS-XC-10G-I2
XFP – 10GE BASE-ZR – SM	ONS-XC-10G-L2
XFP – 10GE BASE-SR – MM	ONS-XC-10G-SR-MM
XFP – 10GE BASE-SW – MM	ONS-XC-10G-SR-MM
SAN	
SFP – ESCON 1310 – MM	ONS-SE-200-MM
SFP – Sysplex CLO/ETR – 1310nm – MM	ONS-SE-200-MM
SFP – Fibre Channel 1G/FICON-1G 100-M5-SN-I	ONS-SE-G2F-SX
SFP – Fibre Channel 1G/FICON-1G 100-M6-SN-I	ONS-SE-G2F-SX
SFP – Fibre Channel 1G/FICON-1G 100-SM-LC-L	ONS-SE-G2F-LX
SFP – Fibre Channel 2G /FICON-2G 200-M5-SN-I	ONS-SE-G2F-SX
SFP – Fibre Channel 2G/FICON-2G 200-M6-SN-I	ONS-SE-G2F-SX
SFP – Fibre Channel 2G/FICON-2G 200-SM-LC-L	ONS-SE-G2F-LX
SFP – Fibre Channel 4G/FICON-4G 400-M5-SN-I	ONS-SE-4G-MM
SFP – Fibre Channel 4G/FICON-4G 400-M6-SN-I	ONS-SE-4G-MM
SFP – Fibre Channel 4G/FICON-4G 400-SM-LC-L	ONS-SE-4G-SM
SFP – ISC-Compat 100-SM-LC-L	ONS-SE-G2F-LX
SFP – ISC-Peer-1G 100-SM-LC-L	ONS-SE-G2F-LX
SFP – ISC-Peer-2G 200-SM-LC-L	ONS-SE-G2F-LX
SFP – Fibre Channel 4G/FICON-4G 100 GHz, LC	ONS-SC-4G-xx.x
XFP – Fibre Channel 10G 1200-SM-LL-L	ONS-XC-10G-S1
XFP – Fibre Channel 10G 1200-MX-SN-I	ONS-XC-10G-SR-MM
XFP – Fibre Channel 8G SM	ONS-XC-8G-SM
Video	
SFP – D1 Video 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – DVB-ASI 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – SDI 1310 – SM	ONS-SI-622-I1/SFP12-4-IR/SFP-L.4.1
SFP – HDTV 1310 – SM	ONS-SE-G2F-LX
SFP – DV6000 1310 – SM	ONS-SI-2G-I1/SFP-OC48-IR/SFP-L.16.1
Data	
SFP – FDDI 1310 – SM	ONS-SI-155-I1/SFP3-1-IR/SFP-L.1.1
SFP – T3 Optical 1310 – SM	ONS-SI-155-I1/SFP3-1-IR

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Module	Unit Name
xWDM	
SFP – OC-48 CWDM, xxxxnm	ONS-SC-Z3-xxxx
SFP – OC-48 DWDM, 100 GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – STM-16 CWDM, xxxxnm	ONS-SC-Z3-xxxx
SFP – STM-16 DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – GE CWDM, xxxxnm	ONS-SC-Z3-xxxx
SFP – GE DWDM, 100 GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – Fibre Channel 1G/FICON-1G CWDM, xxxxnm	ONS-SC-Z3-xxxx
SFP – Fibre Channel 1G/FICON-1G DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
SFP – Fibre Channel 2G/FICON-2G CWDM, xxxxnm	ONS-SC-Z3-xxxx
SFP – Fibre Channel 2G/FICON-2G DWDM, 100GHz, 15xx.xnm	ONS-SC-2G-xx.x
XFP – OC-192 DWDM, 100 GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – STM-64 DWDM, 100 GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – 10GE LAN PHY DWDM, 100 GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – 10G FC DWDM, 100 GHz, 15xx.xnm	ONS-XC-10G-xx.x
XFP – 10G multirate full C-band tunable DWDM, 50 GHz	ONS-XC-10G-C
XFP – OC-192/10GE/OTU2, CWDM, xxxx mn C-Temp, 40km range	ONS-XC-10G-xxxx

Table 2 provides details about supported Interfaces and protection types for the different wavelength interface modules supported by the Cisco ONS 15454 MSTP.

Table 2. Wavelength Interfaces Details

Modules	Supported Service Interfaces	Protection Supported
2.5-Gbps FEC multirate transponder cards 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON ISC-1 ISC-3 ESCON Fast Ethernet (FE) Gigabit Ethernet (GE) T3 (optical) OC-3/STM-1 OC-12/STM-4 OC-48/STM-16 D1-SDI video HDTV C-Cor DV-6000 (2.38-Gbps) ETR/CLO	No protection Optical-path protection Optical-path and equipment protection
2.5-Gbps data muxponder cards 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON ESCON GE	No protection Optical-path protection Optical-path and equipment protection
10-Gbps EFEC multirate transponder cards (4-channel tunable) 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel	No protection Optical-path and equipment protection
4x 2.5-Gbps E-FEC muxponder cards (4-channel tunable) 8 modules, 4-channel tunable for 32-channel, 100-GHz plan, 50-GHz laser stability (C band)	OC-48/STM-16	No protection Optical-path and equipment protection
10-Gbps E-FEC multirate transponder cards (full-band tunable) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, MLSE, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel/FICON	No protection Optical-path and equipment protection

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Modules	Supported Service Interfaces	Protection Supported
4x 2.5-Gbps E-FEC muxponder cards (full-band tunable) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, MLSE, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	OC-48/STM-16	No protection Optical-path and equipment protection
10-Gbps E-FEC data muxponder cards (full-band tunable) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, MLSE, 50-GHz plan and stability (C band) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (L band)	1-Gbps Fibre Channel/FICON 2-Gbps Fibre Channel/FICON 4-Gbps Fibre Channel/FICON ISC-1 ISC-3 GE	No protection Optical-path and equipment protection
GE XPonder units 1 module, Standard version, two DWDM XFP-based trunk 1 module, Enhanced version, two DWDM XFP-based trunk	GE 10 GE LAN	No protection Optical-path protection Layer 2 Ethernet protection (GR3)
10GE XPonder units 1 module, Standard version, two DWDM XFP-based trunk 1 module, Enhanced version, two DWDM XFP-based trunk	10GE LAN	No protection Optical-path protection Layer 2 Ethernet protection (GR3)
MSPP-on-a-Blade 1 module, DWDM XFP-based trunk	OC-3/STM-1 OC-12/STM-4 OC-48/STM-16 OC-192/STM-64 GE	No protection 1+1 APS on client UPSR on trunk
OTU2 XPonder 1 module, DWDM XFP-based trunk	10 GE LAN 10 GE WAN OC-192/STM-64 10 Gigabit Fibre Channel/FICON OTU2	No protection Optical-path protection Optical-path and equipment protection
4x 10-Gbps DPSK muxponder card (full-band tunable) 1 module, full-band tunable for 82-channel, 50-GHz plan and stability (C band)	8 Gigabit Fibre Channel OC-192/STM-64/10GE WAN-PHY 10GE LAN-PHY OTU2 (OC-192/STM-64/10GE WAN-PHY) 10G-FC OTU2e (10GE LAN-PHY)	No protection Optical-path and equipment protection

Table 3 and Table 4 provide details about wavelengths supported for the different wavelength plans, in C band and in L band. Table 5 provides product specifications for the Cisco ONS 15454 MSTP.

Table 3. C Band Wavelength Plan

Wavelength	32 Channels		40 Channels		64 Channels	80 Channels
(nm)	**Odd**	**Even**	**Odd**	**Even**	**50 GHz**	**50 GHz**
1530.3	x		x		x	x
1530.7		x		x	x	x
1531.1	x		x		x	x
1531.5		x		x	x	x
1531.9	x		x		x	x
1532.2		x		x	x	x
1532.6	x		x		x	x
1533.0		x		x	x	x
1533.4			x			x

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Wavelength	32 Channels		40 Channels		64 Channels	80 Channels
(nm)	Odd	Even	Odd	Even	50 GHz	50 GHz
1533.8				x		x
1534.2	x		x		x	x
1534.6		x		x	x	x
1535.0	x		x		x	x
1535.4		x		x	x	x
1535.8	x		x		x	x
1536.2		x		x	x	x
1536.6	x		x		x	x
1537.0		x		x	x	x
1537.4			x			x
1537.7				x		x
1538.1	x		x		x	x
1538.5		x		x	x	x
1538.9	x		x		x	x
1539.3		x		x	x	x
1539.7	x		x		x	x
1540.1		x		x	x	x
1540.5	x		x		x	x
1540.9		x		x	x	x
1541.3			x			x
1541.7				x		x
1542.1	x		x		x	x
1542.5		x		x	x	x
1542.9	x		x		x	x
1543.3		x		x	x	x
1543.7	x		x		x	x
1544.1		x		x	x	x
1544.5	x		x		x	x
1544.9		x		x	x	x
1545.3			x			x
1545.7				x		x
1546.1	x		x		x	x
1546.5		x		x	x	x
1546.9	x		x		x	x
1547.3		x		x	x	x
1547.7	x		x		x	x
1548.1		x		x	x	x
1548.5	x		x		x	x
1548.9		x		x	x	x
1549.3			x			x
1549.7				x		x
1550.1	x		x		x	x
1550.5		x		x	x	x
1550.9	x		x		x	x

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Wavelength	32 Channels		40 Channels		64 Channels	80 Channels
(nm)	Odd	Even	Odd	Even	50 GHz	50 GHz
1551.3		x		x	x	x
1551.7	x		x		x	x
1552.1		x		x	x	x
1552.5	x		x		x	x
1552.9		x		x	x	x
1553.3			x			x
1553.7				x		x
1554.1	x		x		x	x
1554.5		x		x	x	x
1554.9	x		x		x	x
1555.3		x		x	x	x
1555.7	x		x		x	x
1556.1		x		x	x	x
1556.5	x		x		x	x
1556.9		x		x	x	x
1557.3			x			x
1557.7				x		x
1558.1	x		x		x	x
1558.5		x		x	x	x
1558.9	x		x		x	x
1559.3		x		x	x	x
1559.7	x		x		x	x
1560.2		x		x	x	x
1560.6	x		x		x	x
1561.0		x		x	x	x
1561.4			x			x
1561.8				x		x

Table 4. L Band Wavelength Plan – 32-Channel Odd

λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)	λ (nm)
1577.8	1581.1	1584.5	1587.8	1591.2	1594.6	1598.0	1601.4
1578.6	1582.0	1585.3	1588.7	1592.1	1595.4	1598.8	1602.3
1579.5	1582.8	1586.2	1589.5	1592.9	1596.3	1599.7	1603.1
1580.3	1583.6	1587.0	1590.4	1593.7	1597.1	1600.6	1604.0

Table 5. Product Specifications

Item	Specification
Nodes per network	60
Wavelengths C band L band	 80 + 1 (OSC) (with 50 GHz channels spacing) 32 + 1 (OSC)
Wavelength spacing	100 GHz (50 GHz channels spacing available)

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Item	Specification
Optical reach, single span, point-to-point (amplified)	
80 channels	103 miles (160 km)
40 channels	113 miles (180 km)
20 channels	122 miles (200 km)
Number of spans	40
Ring circumference	2000 miles (3200 km)
Fiber type	Single-mode fiber (G.652, G.653 G.655, G.656)
Power requirements	Typical/Maximum
Terminal node	253W/403W
ROADM node	
Degree-2	461W/641W
Degree-8	809W/1,118W
OADM node	
Amplified	250W/334W
Passive	174W/212W
Line amplifier node	
EDFA	200W/307W
Raman	288W/415W
SMROADM node	
Degree-2	265W/447W
Degree-4	313W/561W
Physical dimensions	
ANSI shelf assembly	
Rack mounting	19-in. or 23-in. EIA rack-mounting
Shelf assembly	18.5 in. (H) x 17.6 in. (W) x 12.0 in. (D)
ETSI shelf assembly	
Rack mounting	600mm or 19-in. rack-mounting[1]
Shelf assembly	616.5mm (H) x 445mm (W) x 280mm (D)
Environmental conditions	
Storage temperature	–40ºC to 70ºC (–40ºF to 158ºF)
Operating temperature	
Normal	0ºC to 55ºC (32ºF to 131ºF)
Short term[2]	–5ºC to 55ºC (23ºF to 131ºF)
Relative humidity	
Normal	5% to 85%, non condensing
Short term[2]	5% to 90% but not to exceed 0.024 kg water/kg of dry air

1. 19-inch mounting brackets have to be ordered separately

2. Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.)

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Regulatory Standards Compliance

Table 6 summarizes regulatory standard compliance and agency approvals. Table 7 provides a list of standards which are applicable to Cisco ONS 15454 MSTP but for which compliance may be applicable to selected sections only.

Table 6. Regulatory Standard Compliance and Agency Approvals

ANSI (15454) System	ETSI (15454E) System
Supported Countries	
• Canada • United States • Korea	• Europe • Latin America • Japan • Asia Pacific • Middle-East and Africa
EMC (Class A)	
• ICES-003 Issue 4 (2004) • GR-1089-CORE, Issue 4 (Type 2 and Type 4 equipment) • GR-1089-CORE – Issue 03 (Oct 2002) (Objective O3-2 – Section 3.2.1 – Radiated Emissions requirements with all doors open) • FCC 47CFR15, Class A subpart B (2006)	• EN 300 386 v1.3.3 (2005) and v1.4.1 (2007) • CISPR 22 – Fifth edition (2005-04) Class A and the amendment 1 (2005-07) • CISPR 24 – First edition (1997-09) and amendment 1 (2001-07) and amendment 2 (2002-10). • EN 55022:1998 Class A – CENELEC Amendment A2:2003 • EN 55024:1998 – CENELEC Amendment A1:2001 and Amendment A2:2003 • Resolution 237 (Brazil) • VCCI V-3/2006.04 • EN 61000-6-1:2001 • EN 61000-6-2:1999
Safety	
• UL/CSA 60950 -1 First Edition (2003) • GR-1089-CORE, Issue 4 (Type 2 and Type 4 equipment)	• UL/CSA 60950 -1 First Edition (2003) • IEC 60950-1 (2001/10)/Amendment 11:2004 to EN 60950-1:2001, 1st Edition (with all country deviations)
Environmental	
• GR-63-CORE, Issue 3 (2006)	• ETS 300-019-2-1 V2.1.2 (Storage, Class 1.1) • ETS 300-019-2-2 V2.1.2 (Transportation, Class 2.3) • ETS 300-019-2-3 V2.1.2 (Operational, Class 3.1E) • EU WEEE regulation • EU RoHS regulation
Power & Grounding	
• GR-1089-CORE, Issue 4	• ETS 300 132-2
Optical Safety	
• EN or IEC-60825-2 Third edition (2004-06) • EN or IEC 60825-1 Consol. Ed. 1.2 – incl. am1+am2 (2001-08) • 21CFR1040 (2004/04) (Accession Letter and CDRH Report) • IEC-60825-2 Third edition (2004-06) • ITU-T G.664 (2006)	
Miscellaneous	
• Acoustic Noise ◦ GR-63-CORE, Issue 3 (2006) ◦ ETS 300 753 ed.1 (1997-10) • Rain, Sand, Dust and Moisture Proofing ◦ AS 1939-1990, 4.2, IP 53 • Mechanical Shock & Bumps ◦ AS1099- 2.27 • Customer specific requirements ◦ AT&T Network Equipment Development Standards (NEDS) Generic Requirements, AT&T 802-900-260 ◦ SBC TP76200MP ◦ Verizon SIT.NEBS.NPI.2002.010	

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Table 7. Standards Applicable to Cisco ONS 15454 MSTP

Standard	Title
Optical Fiber	
ITU-T G.652 (A, B, C, D)	Characteristics of a single-mode optical fibre and cable
ITU-T G.653	Characteristics of a dispersion-shifted single-mode optical fibre and cable
ITU-T G.654	Characteristics of a cut-off shifted single-mode optical fibre and cable
ITU-T G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
ITU-T G.656	Characteristics of a fibre and cable with non-zero dispersion for wideband optical transport
Optical Systems	
ITU-T G.691	Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers
ITU-T G.692	Optical interfaces for multichannel systems with optical amplifiers
ITU-T G.693	Optical interfaces for intra-office systems
ITU-T G.694.1	Spectral grids for WDM applications: DWDM frequency grid
ITU-T G.694.2	Spectral grids for WDM applications: CWDM wavelength grid
ITU-T G.695	Optical interfaces for coarse wavelength division multiplexing applications
ITU-T G.697	Optical monitoring for DWDM systems
Telcordia GR-253-CORE – Issue 04	Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria
Optical Amplifiers	
ITU-T G.661	Definition and test methods for the relevant generic parameters of optical amplifier devices and subsystems
ITU-T G.662	Generic characteristics of optical amplifier devices and subsystems
ITU-T G.663	Application related aspects of optical amplifier devices and subsystems
ITU-T G.665	Generic characteristics of Raman amplifiers and Raman amplified subsystems
Performance Monitoring and Management Interface	
ITU-T G.826	End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections
ITU-T G.829	Error performance events for SDH multiplex and regenerator sections
ITU-T G.874	Management aspects of the optical transport network element
Telcordia GR-253-CORE – Issue 04	Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria
Telcordia GR-474-CORE	Alarm and Control for Network Elements
Telcordia GR-2998-CORE	Generic Requirements for WDM EMSs
Ethernet	
IEEE 802.1D	IEEE Standard for local and metropolitan area networks – Media access control (MAC) Bridges
IEEE 802.1Q	IEEE Standard for Local and Metropolitan Area Networks – Virtual Bridged Local Area Networks
IEEE 802.1ad	Amendment to IEEE 802.1Q-2005. IEEE Standard for Local and metropolitan area networks — Virtual Bridged Local Area Networks
IEEE 802.3ab	1000BASE-T Gbps Ethernet over twisted pair at 1 Gbps (125 MBps)
IEEE 802.3ae	10 Gbps (1,250 MBps) Ethernet over fiber; 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, 10GBASE-EW
MEF 9	Abstract Test Suite for Ethernet Services at the UNI
MEF 14	Abstract Test Suite for Traffic Management Phase 1
ITU-T Y.1731	OAM functions and mechanisms for Ethernet based networks

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Standard	Title
SONET, SDH and OTN	
ITU-T G.707	Network node interface for the synchronous digital hierarchy (SDH)
ITU-T G.709	Interfaces for the Optical Transport Network (OTN)
ITU-T G.781	Synchronization layer functions
ITU-T G.783	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
ITU-T G.784	Synchronous digital hierarchy (SDH) management
ITU-T G.798	Characteristics of optical transport network hierarchy equipment functional blocks
ITU-T G.805	Generic functional architecture of transport networks
ITU-T G.811	Timing characteristics of primary reference clocks
ITU-T G.812	Timing requirements of slave clocks suitable for use as node clocks in synchronization networks
ITU-T G.813	Timing characteristics of SDH equipment slave clocks (SEC)
ITU-T G.823	The control of jitter and wander within digital networks which are based on the 2048 Kbps hierarchy
ITU-T G.824	The control of jitter and wander within digital networks which are based on the 1544 Kbps hierarchy
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)
ITU-T G.8251	The control of jitter and wander within the optical transport network (OTN)
ITU-T G.841	Types and characteristics of SDH network protection architectures
ITU-T G.872	Architecture of optical transport networks
ITU-T G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy
ITU-T G.959.1	Optical transport network physical layer interfaces
ITU-T G.Sup43	Transport of IEEE 10GBASE-R in optical transport networks (OTN)
ITU-T G.7041	Generic framing procedure (GFP)
ANSI T1.105	Synchronous Optical Network (SONET) – Basic Description including Multiplex Structure, Rates, and Formats

Ordering Information

To place an order, visit the Cisco Ordering homepage. To download software, visit the Cisco Software Center.

Table 8 provides ordering information.

Table 8. Ordering Information

Product ID	Description
Common Equipment – M12	
15454-SA-HD= 15454-SA-HD-DDR= 15454E-SA-ETSI=	Shelf assembly, Cisco ONS 15454
15454-TCC2P-K9= 15454E-TCC2P-K9= 15454-TCC3-K9= 15454E-TCC3-K9=	Timing, Communications, and Control Card, Version 2 Plus (TCC2P), 15454 chassis Timing, Communications, and Control Card, Version 2 Plus (TCC2P), 15454E chassis Timing, Communications, and Control Card, Version 3 (TCC3), I-Temp, 15454 chassis Timing, Communications, and Control Card, Version 3 (TCC3), I-Temp, 15454E chassis
15454-CC-FTA= 15454E-CC-FTA= 15454-FTA3-T= 15454E-FTA-48V=	Controlled cooling fan-tray assembly, includes fan-tray filter Fan-tray assembly, includes fan-tray filter
15454E-CTP-MIC48V=	Mechanical interface card, craft, timing, and power inputs, ETSI
15454E-AP-MIC48V=	Mechanical interface card, alarm, and power inputs, ETSI
15454-AIR-RAMP= 15454E-AIR-RAMP=	Air ramp (ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets)
15454-AIC-I= 15454E-AIC-I=	Alarm Interface Controller, international card
15454-BLANK= 15454E-BLANK= 15454E-BLANK-FMEC=	Shelf slot-filler panel, fits any slot in Cisco ONS 15454 ANSI shelf assembly Shelf slot-filler panel, fits any slot in Cisco ONS 15454 ETSI shelf assembly Shelf FMEC slot-filler panel, fits Cisco ONS 15454 ETSI shelf assembly
15454-MS-ISC-100T=	Integrated 100T Ethernet switch for multi-shelf management

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Product ID	Description
15454-EAP-MF=	Mechanical frame for Ethernet adapter panel (ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets). Ships with 2x RJ-45/RJ-45 cables (0.15m) to connect MS-ISC units with the TCC2P units and with 1x RJ-45/RJ-45 cable (0.5m) to connect the MS-ISC units among themselves.
15454-EAP=	Ethernet adapter panel (to be used with MS-ISC-100T to allow proper cable management)
15454-MEC=	Multiple Ethernet cable to replicate the MS-ISC-100T Ethernet ports on the EAP unit
Common Equipment – M6	
15454-M6-SA=	6-service-slot MSTP shelf, includes M-SHIPKIT, M6-FTF
15454-M6-FTA=	6-service-slot MSTP chassis fan tray
15454-M6-LCD=	6-service-slot MSTP chassis LCD with backup memory
15454-M6-ECU=	6-service-slot MSTP chassis external cable connections
15454-M6-DC=	6-service-slot MSTP chassis DC power filter
15454-M6-AC=	6-service-slot MSTP chassis AC power supply
15454-M6-BRKT23=	Right front inlet; left back exhaust
15454-M6-BRKT21=	Inlet right front; exhaust left front, left back, or left top
15454-M6-BRKT19=	No deflectors
15454-M6-PWRFLR=	6-service-slot MSTP power filter filler card
15454-M6-FTF=	6-service-slot MSTP chassis fan tray filter
15454-M6-DR=	6-service-slot MSTP chassis door
Common Equipment – M2	
15454-M2-SA=	2-service-slot MSTP shelf, includes M-SHIPKIT, M2-FTF
15454-M2-FTA=	2-service-slot MSTP chassis fan tray
15454-M2-DC=	2-service-slot MSTP chassis DC ANSI filter with memory
15454-M2-DC-E=	2-service-slot MSTP chassis DC ETSI filter with memory
15454-M2-AC=	2-service-slot MSTP chassis AC power supply with memory
15454-M2-BRKT23=	Right front inlet; left back exhaust
15454-M2-BRKT21=	Inlet right front; exhaust left front, left back, or left top
15454-M2-BRKT19=	No deflectors
15454-M2-WM=	2-service-slot MSTP chassis wall mount bracket
15454-M2-FTF=	2-service-slot MSTP chassis air filter
15454-M2-DR=	2-service-slot MSTP chassis door
Common Equipment – M6 and M2	
15454-M-TNC-K9= 15454-M-TSC-K9=	Transport Node Controller for M2 and M6 chassis Transport Shelf Controller for M2 and M6 chassis
15454-M-T-FILLER= 15454-M-FILLER=	Detectable control slot filler card Detectable line slot filler card
Common Equipment	
15454-PP-64-LC=	64-port fiber patch-panel shelf, 1 rack unit (1RU) high, LC-to-LC connectors, 32 duplex LC adapters, supports up to 8 multi-fiber cable assemblies (1 MPO to 8x LC), includes 2 MPO to 8x LC 2.3-meter cable assemblies (uninstalled). Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-PP2-64-LC=	64-port fiber patch-panel shelf, 2RU high, LC-to-LC connectors, 32 duplex LC adapters, includes 8 MPO to 8x LC 2.3-meter cable assemblies (pre-cabled). Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-PP-80-LC=	80-port fiber patch-panel shelf, 2RU high, LC-to-LC connectors, 40 duplex LC adapters, includes 10 MPO to 8x LC 2.3-meter cable assemblies (pre-cabled). Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-PP-MESH-4=	Degree-4 mesh patch panel, 2RU high, 1x LC and 1x MPO adapter per direction. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-PP-MESH-8=	Degree-8 mesh patch panel, 2RU high, 1x LC and 1x MPO adapter per direction. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-PP-4-SMR=	Degree-4 mesh patch panel for single-mode ROADM, 1RU high, 1x MPO adapter per direction. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.

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Product ID	Description
15454-FBR-STRG=	Fiber-storage shelf, supports eight 2-meter ribbon cables (8-fiber) plus 40 2-meter 2-mm fiber cables. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15216-FL-SA=	FlexLayer shelf assembly, 4 module slots, 1 RU high, Cisco FlexLayer platform. Ships with ANSI 19-in. and 23-in. mounting brackets.
15216-CS-SM-Y=	Y-cable splitter/combiner module for 2 wavelengths protection, single-mode fiber, single-width module, installs in Cisco FlexLayer (15216-FL-SA=) shelf assembly
15216-CS-MM-Y=	Y-cable splitter/combiner module for 2 wavelengths protection, multimode fiber, single-width module, installs in Cisco FlexLayer (15216-FL-SA=) shelf assembly
15454-YCBL-LC=	Y-cable storage shelf, 2 RUs high, supports up to 8 Y-cable splitter/combiner modules. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-YCM-SM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, single-mode fiber, LC adapters, installs in Cisco Y-cable storage (15454-YCBL-LC=) shelf assembly
15454-YCM-MM-LC=	Y-cable splitter/combiner module for 1 wavelength protection, multimode fiber, LC adapters, installs in Cisco Y-cable storage (15454-YCBL-LC=) shelf assembly
Service Interfaces[1]	
15454-10DME-C=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10DMEX-C=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors. Extended version of 15454-10DME-C= leveraging on 2nd Generation MLSE (Maximum Likelihood Sequence Estimation)
15454-10DME-L=	10-Gbps E-FEC data muxponder card, 8x SFP-based client interfaces, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10E-L1-C=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10EX-L1-C=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors. Extended version of 15454-10E-L1-C= leveraging on 2nd Generation MLSE (Maximum Likelihood Sequence Estimation)
15454-10E-L1-L=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10E-L1-xx.x=	10-Gbps E-FEC multirate transponder card, 1x XFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
15454-10GE-XP=	10GE E-FEC Ethernet Crossponder, 2x XFP-based client interfaces, 2x XFP-based trunk interfaces
15454-10GE-XPE=	10GE E-FEC Ethernet Enhanced Crossponder, 2x XFP-based client interfaces, 2x XFP-based trunk interfaces
15454-10ME-L1-C=	4x OC-48/STM-16 E-FEC muxponder card, 4x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
15454-10MEX-L1-C=	4x OC-48/STM-16 E-FEC muxponder card, 4x SFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors. Extended version of 15454-10ME-L1-C= leveraging on 2nd Generation MLSE (Maximum Likelihood Sequence Estimation)
15454-10ME-L1-L=	4x OC-48/STM-16 E-FEC muxponder card, 4x SFP-based client interfaces, full L-band tunable on 50-GHz ITU wavelengths, DWDM line with LC connectors
15454-10ME-xx.x=	4x OC-48/STM-16 E-FEC muxponder, 4x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), DWDM line with LC connectors – C band
15454-ADM-10G=	10Gbps E-FEC ADM-On-A-Blade, 16x SFP-based client interfaces, 1x XFP-based interconnection interface, 2x XFP-based trunk interfaces
15454-DM-L1-xx.x=	2.5-Gbps data muxponder card, 8x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), unprotected DWDM line with LC connectors – C band
15454-DMP-L1-xx.x=	2.5-Gbps data muxponder card, 8x SFP-based client interfaces, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band
15454-GE-XP=	GE E-FEC Ethernet CrossPonder, 20x SFP-based client interfaces, 2x XFP-based trunk interfaces
15454-GE-XPE=	GE E-FEC Ethernet Enhanced Crossponder, 20x SFP-based client interfaces, 2x XFP-based trunk interfaces
15454-MR-L1-xx.x=	100-Mbps to 2.5-Gbps FEC multirate transponder card, 1x SFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), unprotected DWDM line with LC connectors – C band
15454-MRP-L1-xx.x=	100-Mbps to 2.5-Gbps FEC multirate transponder card, 1x SFP-based client interface, 4-channel tunable on 32-channels Odd 100-GHz ITU wavelengths (50-GHz stability), protected DWDM line with LC connectors – C band

1 Wavelength plan is outlined in Tables 3 and 4 in this document. Cisco online lead-time tool is available for determining the lead-time of individual wavelengths, if different.

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Product ID	Description
15454-OTU2-XP=	4x OTN E-FEC Multirate Xponder, 2x XFP-based trunk/client FEC interfaces, 2x XFP-based trunk/client E-FEC interfaces
15454-40G-MXP-C=	4x 10-Gbps DPSK 40-Gbps muxponder card, 4x XFP-based client interfaces, full C-band tunable on 50-GHz ITU wavelengths (Odd and Even), DWDM line with LC connectors
Optical Transmission Elements	
15454-32-DMX=	32-channel demultiplexer 100-GHz (for use with 32-WSS), C-band, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-32-DMX-L=	32-channel demultiplexer 100-GHz (for use with 32-WSS), L-band, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-32DMX-O=	32-channel demultiplexer card, C-band, Odd grid, 100-GHz, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-32MUX-O=	32-channel multiplexer card, C-band, Odd grid, 100-GHz, MPO connectors for add path, LC connector for interconnection
15454-32-WSS=	32-channel wavelength selective switch 100-GHz, C-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-32-WSS-L=	32-channel wavelength selective switch 100-GHz, L-band, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-DMX-C=	40-channel demultiplexer 100-GHz (for use with 40-WSS-C, 40-MUX-C or 40-WXC-C), C-band, Odd grid, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-DMX-CE=	40-channel demultiplexer 100-GHz (for use with 40-WSS-CE), C-band, Even grid, MPO connectors for drop path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-MUX-C=	40-channel multiplexer 100-GHz (for use with 40-DMX-C or 40-WXC-C), C-band, Odd grid, MPO connectors for add path, LC connector for interconnection, includes one 2-meter LC/LC fiber-optic cables
15454-40-WSS-C=	40-channel wavelength selective switch 100GHz, C-band, Odd grid, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-WSS-CE=	40-channel wavelength selective switch 100-GHz, C-band, Even grid, MPO connectors for add path, LC connectors for interconnection, includes two 2-meter LC/LC fiber-optic cables
15454-40-WXC-C=	40-channel wavelength cross connect 100-GHz, C-band, Odd grid, MPO connector for interconnection with Mesh Patch Panel, LC connectors for interconnection, includes one 2-meter LC/LC fiber-optic cable
15454-80-WXC-C=	80-channel wavelength cross connect 50-GHz, C-band, Odd and Even grid, LC connectors
15454-40-SMR1-C=	40-channel single-module ROADM, 100-GHz, C-band, LC connectors for interconnection and add path, includes one 2-meter LC/LC fiber-optic cable and one 0-dB LC/LC loopback (to be used if DCU is not required). Combines the OSC add/drop filter, a pre-amplifier and a 2x1 WSS-based ROADM core into a single slot unit.
15454-40-SMR2-C=	40-channel single-module ROADM, 100-GHz, C-band, LC connectors for interconnection, MPO connector for interconnection with Mesh Patch Panel, includes one 0-dB LC/LC loopback (to be used if DCU is not required). Combines the OSC add/drop filter, PRE and BST amplifiers and a 4x1 WSS-based ROADM core.
15216-MD-40-ODD=	40-Channel Multiplexer and Demultiplexer Passive Patch Panel, 100-GHz, C-band – Odd, 2RU high, 40 duplex LC add and drop ports, 3 duplex LC ports for internal and monitor connections, USB port for passive inventory. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15216-MD-40-EVEN=	40-Channel Multiplexer and Demultiplexer Passive Patch Panel, 100-GHz, C-band – Even, 2RU high, 40 duplex LC add and drop ports, 3 duplex LC ports for internal and monitor connections, USB port for passive inventory. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15454-4MD-xx.x=	4-channel multiplexer and demultiplexer card, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-1B-xx=	1-band OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-1C-xx.x=	1-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-2C-xx.x=	2-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-4B-xx=	4-band OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-AD-4C-xx.x=	4-channel OADM, C-band, 100-GHz, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15216-HD-EXT-PNL=	Edge Mounting Bracket
15216-FLD-4-xx.x=	Edge 4-Channel Bidirectional OADM Module 15xx.xx to 15xx.xx
15216-FLC-CWDM-8=	Edge 8-Channel CWDM Multiplexer/Demultiplexer Module
15216-FLD-OSC=	Edge Optical Service Channel Add/Drop
15454-MMU=	Multi-ring/mesh upgrade unit, C-band and L-band (for use with 32-WSS/32-DMX or 32-WSS-L/32-DMX-L), LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-AMP-17C=	Optical amplifier, 17dBm output power, 17dB gain, can be configured as preamplifier or booster, C-band, 80-

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Product ID	Description
	channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables

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Product ID	Description
15454-OPT-AMP-C=	Enhanced optical amplifier, 20dBm output power, can be configured as preamplifier or booster, C-band, 80-channel, 50-GHz compatible, LC connectors, midstage access, includes one LC/LC loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OPT-AMP-L=	Optical amplifier, 20dBm output power, can be configured as preamplifier or booster, L-band, 64-channel, 50-GHz compatible, LC connectors, midstage access, includes one 4-dB LC/LC attenuated loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OPT-BST=	Optical booster amplifier, 17dBm output power, C-band, 80-channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-BST-E=	Optical enhanced booster amplifier, 20dBm output power, C-band, 80-channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-BST-L=	Optical booster amplifier, 17dBm output power, L-band, 64-channel, 50-GHz compatible, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OPT-PRE=	Optical preamplifier, 17dBm output power, C-band, 80-channel, 50-GHz compatible, LC connectors, midstage access, includes one 4-dB LC/LC attenuated loopback (to be used if DCU is not required)
15454-OPT-RAMP-C=	Optical Raman amplifier with embedded EDFA, 500mW total counter-propagating Raman pump power, 17dBm EDFA output power, C-band, 80-channel, 50-GHz compatible, LC connectors, midstage access, includes one LC/LC loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OPT-RAMP-CE=	Extended Performance Optical Raman amplifier with embedded EDFA, 500mW total counter-propagating Raman pump power, 2 pump wavelengths, 20dBm EDFA output power, C-band, 80-channel, 50-GHz compatible, LC connectors, midstage access, includes one LC/LC loopback (to be used if DCU is not required) and two 2-meter LC/LC fiber-optic cables
15454-OSC-CSM=	Optical service channel card, integrated combiner/separator, 1510nm, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-OSCM=	Optical service channel card, 1510-nm, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-PSM=	Protection Switching Module, LC connectors
15216-DCU-SA=	Dispersion-compensation unit shelf, two module slots, 1RU high. Ships with ANSI 19-in. and 23-in. and ETSI 600mm mounting brackets.
15216-DCM-<value>	Dispersion-compensation module, LC connectors, different fiber types and lengths supported for both C-band and L-band as part of the Cisco ONS 15216 product family
15454-TDC-CC=	Tunable Dispersion Compensation Unit Coarse Granularity, tunable from 110ps/nm to 1,650ps/nm with steps of 110ps/nm, C band, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15454-TDC-FC=	Tunable Dispersion Compensation Unit Fine Granularity, tunable from 45ps/nm to 675ps/nm with steps of 45ps/nm, C Band, LC connectors, includes two 2-meter LC/LC fiber-optic cables
15216-ID-50=	50 GHz/100GHz Optical Interleaver and De-interleaver Module, single-width module, installs in Cisco FlexLayer shelf assembly (15216-FL-SA)
15216-MD-ID-50=	50-GHz/100-GHz Optical Interleaver and De-interleaver Module, installs in Cisco 15216-MD-40 units
15216-SC-CL=	C-band and L-band Splitter and Combiner Module, single-width module, installs in Cisco FlexLayer shelf assembly (15216-FL-SA)
Pluggable Optics Modules	
15454-SFP3-1-IR= 15454E-SFP-L.1.1=	OC-3/STM-1/D1-SDI SFP optics module, intermediate-reach, 1310nm, single-mode, LC connector
ONS-SI-155-SR-MM=	OC-3/STM-1 SFP optics module, intermediate-reach, 1310nm, multi-mode, industrial temperature, LC connector
ONS-SI-155-I1=	OC-3/STM-1 SFP optics module, intermediate-reach, 1310nm, single-mode, industrial temperature, LC connector
ONS-SI-155-L2=	OC-3/STM-1 SFP optics module, long-reach, 1550nm, single-mode, industrial temperature, LC connector
ONS-SC-155-EL=	SFP – STM-1 Electrical, standard coaxial (75ohm) connector
15454-SFP12-4-IR= 15454E-SFP-L.4.1=	OC-12/STM-4 SFP optics module, intermediate-reach, 1310nm, single-mode, LC connector
ONS-SI-622-I1=	OC-12/STM-4/OC-3/STM-1 SFP optics module, intermediate-reach, 1310nm, single-mode, industrial temperature, LC connector
15454-SFP-OC48-IR= 15454E-SFP-L.16.1=	OC-48/STM-16 SFP optics module, intermediate-reach, 1550nm, single-mode, LC connector
ONS-SE-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310nm, single-mode, LC connector
ONS-SI-2G-S1=	OC-48/STM-16 SFP optics module, short-reach/intra-office, 1310nm, single-mode, Industrial Temp, LC connector
ONS-SE-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550nm, single-mode, LC connector

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Product ID	Description
ONS-SI-2G-L2=	OC-48/STM-16 SFP optics module, long-reach/long-haul, 1550nm, single-mode, Industrial Temp, LC connector
ONS-SE-Z1=	OC-48/STM-16/OC-12/STM-4/OC-3/STM-1 SFP optics module, 1310nm, single-mode, LC connector
ONS-SC-Z3-XXXX=	OC-48/STM-16/GE SFP optics module, CWDM, XXXX-nm, single-mode, Commercial Temp, LC connector
ONS-SE-200-MM=	ESCON SFP optics module, short-reach, 1310-nm, multimode, LC connector
ONS-SE-G2F-LX=	GE, Fibre Channel (1- and 2-Gbps) and HDTV SFP optics module, long-reach, 1310nm, single-mode, LC connector
ONS-SE-G2F-SX=	GE and Fibre Channel (1- and 2-Gbps) SFP optics module, short-reach, 850nm, multimode, LC connector
ONS-SE-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550nm, single-mode, LC connector
ONS-SI-GE-ZX=	GE SFP optics module, 1000BASE-ZX interface, 1550nm, single-mode, Industrial Temp, LC connector
ONS-SE-ZE-EL=	10/100/1000 Ethernet SFP electrical module, BASE-T interface, RJ-45 connector
ONS-SE-4G-SM=	4-Gbps Fibre Channel SFP optics module, 1310nm, single-mode, LC connector
ONS-SE-GE-BXU=	GE SFP optics module, 1000BASE BX U, single fiber application – upstream, Extended Temp, 1310nm TX and 1490nm RX, single-mode, single LC connector
ONS-SE-GE-BXD=	GE SFP optics module, 1000BASE BX D, single fiber application – downstream, Extended Temp, 1490nm TX and 1310nm RX,single-mode, single LC connector
ONS-SE-4G-MM=	4-Gbps Fibre Channel SFP optics module, 850nm, multimode, LC connector
ONS-SC-4G-xx.x=	4-Gbps Fibre Channel SFP optics module, DWDM, 15xx.x, 100 GHz, LC connector - Commercial Temp
ONS-SC-2G-xx.x=	OC-48/STM-16 SFP optics module, DWDM, 15xx.x-nm, single mode, LC connector
ONS-XC-10G-SR-MM=	10 GE/10-Gbps Fibre Channel XFP optics module, short-reach, 850nm, multimode, LC connector
ONS-XC-10G-S1=	OC-192/STM-64/10 GE/10-Gbps Fibre Channel XFP optics module, short-reach, 1310nm, single-mode, LC connector
ONS-XC-10G-L2=	OC-192/STM-64 XFP optics module, long-reach, 1550nm, single-mode, LC connector
ONS-XC-10G-I2=	OC-192/STM-64 IR2/10 GE XFP optics module, intermediate-reach, 1550nm, single-mode, LC connector
ONS-XC-10G-xx.x=	OC-192/STM-64/10 GE XFP optics module, DWDM, 15xx.x-nm, single-mode, LC connector
ONS-XC-10G-C=	OC-192/STM-64/10 GE XFP optics module, DWDM, Full C-band Tunable, 50 GHz, single-mode, LC connector
ONS-XC-10G-xxxx=	OC-192/10GE/OTU2, CWDM, xxxx mn, XFP Commercial Temp, 40km range
ONS-SC-E3-T3-PW=	SFP-E3/DS-3 PDH over FE pseudowire – Commercial Temp
ONS-XC-8G-SM=	8-Gbps Fibre Channel XFP SM
ONS-SC-OSC-ULH=	SFP-OC3/STM1/FE Optical Service Channel SFPs ULH–Commercial Temp
Cable Assemblies	
15454-MPO-MPO-2=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 2.0 meters (m)
15454-MPO-XMPO-2=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon crossed, single mode, 2.0m, for use with SMR-2 units for Degree-2 ROADM Node configurations (no PP-4-SMR required)
15454-MPO-MPO-4=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 4.0m
15454-MPO-MPO-6=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 6.0m
15454-MPO-MPO-8=	Multi-fiber patchcord – MPO 8-fiber ribbon to MPO 8-fiber ribbon, single mode, 8.0m
15454-MPO-8LC-2=	Cable assembly, MPO 8-fiber ribbon to 8x LC/PC, single-mode, 2.3m
15454-LC-LC-2=	Cable assembly, LC/PC-to-LC/PC, single-mode, 2.0m, 2mm jacket
15216-LC-LC-5=	Cable assembly, LC/PC-to-LC/PC, single-mode, 4.0m, 2mm jacket
15216-LC-LC-10=	Cable assembly, LC/PC-to-LC/PC, single-mode, 6.0m, 2mm jacket
15216-LC-LC-20=	Cable assembly, LC/PC-to-LC/PC, single-mode, 8.0m, 2mm jacket
15216-LC-LC-MM-2=	Cable assembly, LC/PC-to-LC/PC, multimode, 2.0m, 2mm jacket
15216-LC-LC-MM-5=	Cable assembly, LC/PC-to-LC/PC, multimode, 5.0m, 2mm jacket
15216-LC-SC-5=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 4.0m, 2mm jacket
15216-LC-SC-10=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 6.0m, 2mm jacket
15216-LC-SC-20=	Cable assembly, LC/PC-to-SC/UPC, single-mode, 8.0m, 2mm jacket
15454-MPO-8LC-4=	Multi-fiber patchcord – MPO to 8xLC – 4m

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Product ID	Description
15454-MPO-8LC-6=	Multi-fiber patchcord – MPO to 8xLC – 6m
15454-MPO-8LC-8=	Multi-fiber patchcord – MPO to 8xLC – 8m
Software and User Documentation	
15454-LIC-9.2.0K9 15454E-LIC-9.2.0K9	Right-to-use upgrade license, Release 9.2.0, Cisco ONS 15454
15454-R9.2.0SWK9= 15454E-R9.2.0SWK9=	System software, Release 9.2.0, Cisco ONS 15454, CD-ROM
SF15454M-R9.2.0K9 SF15454-R9.2.0K9	15454 ANSI MSTP Rel. 9.2.0 software, preloaded on TCC2P, TCC3, TNC, and TSC 15454 ANSI MSPP Rel. 9.2.0 software, preloaded on TCC2P and TCC3
SF15454ME-R9.2.0K9 SF15454E-R9.2.0K9	15454 ETSI MSTP Rel. 9.2.0 software, preloaded on TCC2P, TCC3, TNC, and TSC 15454 ETSI MSPP Rel. 9.2.0 software, preloaded on TCC2P and TCC3
15454-DOC9.2.0CD= 15454E-DOC9.2.0CD=	User document, Cisco ONS 15454, Release 9.2.0, Cisco ONS 15454, CD version

Warranty

The following are warranty terms that apply to Cisco ONS 15454 MSTP as well as services you may use during the warranty period. Your formal Warranty Statement appears in the Cisco Information Packet that accompanies your Cisco product.

- Hardware warranty duration: Five (5) years
- Software warranty duration: One (1) year
- Hardware replacement, repair, or refund procedure: Cisco or its service center will use commercially reasonable efforts to ship a replacement part for delivery within fifteen (15) working days after receipt of the defective product at Cisco's site. Actual delivery times of replacement products may vary depending on customer location.

Product warranty terms and other information applicable to Cisco products are available at: http://www.cisco.com/go/warranty.

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco services help you to protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business.

For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

For More Information

For more information about the Cisco ONS 15454 Multiservice Transport Platform, contact your local account representative or visit Cisco at: www.cisco.com/go/optical or www.cisco.com/go/IPoDWDM.

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Printed in USA C78-601197-00 04/10

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